

FETAL DEVELOPMENT

UNDERSTANDING
THE STAGES

I NTRODUCTION FETAL DEVELOPMENT

The information in this booklet was designed to inform you of the probable physical characteristics and functions of an unborn fetus throughout your pregnancy. This booklet will detail the development of the embryo and fetus in approximately two-week intervals from fertilization to birth. It will include such details as average weight and length, organ development and movement for that age. The length of the fetus is measured from the head to the buttocks.

There are two distinct ways in which medical professionals figure the age of a pregnancy: weeks after the first day of the last menstrual period, or menstrual weeks, and weeks after fertilization. This booklet will follow the menstrual weeks method, the method most often used in medical offices. In general, the “menstrual weeks” are two weeks ahead of the “weeks after fertilization.” For example, 6 menstrual weeks is the same as 4 weeks after fertilization.

In this booklet you will find percentages referring to the survival rate of a fetus at various stages of its development. National statistics are often reported in terms of a newborn's weight. However, a newborn's weight does not always match its gestational age (see definition). Very small babies who survive are often further along in their development than originally thought, and are often small for their age. In many cases, an accurate estimate of gestational age is not possible either before or after birth, therefore, the survival rate percentages should be considered approximate.



DEFINITION OF TERMS

The following terms will be used throughout this booklet, and will be emphasized with *italics* the first time they are used. They are defined here in order to help a woman better understand each stage of development.

- **AMNIOTIC FLUID:** Fluid in the sac surrounding and protecting the fetus in the mother's uterus.
- **EMBRYO:** After fertilization, the combined egg and sperm is called a zygote. The zygote quickly divides into a cluster of different types of cells which form the embryo. The developing embryo becomes a fetus which becomes a baby when born.
- **FETAL DEVELOPMENT:** The growth process of a fetus inside a woman.
- **FERTILIZATION:** The point at which a woman's egg is penetrated by the male sperm providing the necessary male and female components for a fetus.
- **FETUS:** From eleven weeks after the woman's last menstrual period (nine weeks after fertilization) the developing embryo is now called a fetus and becomes a baby when born.
- **FIRST TRIMESTER:** The first three months of a woman's pregnancy.
- **FULL TERM:** A fetus is considered full term, ready for birth, at forty weeks after the last menstrual period (38 weeks after fertilization).
- **GESTATIONAL AGE:** The age of a developing embryo or fetus, stated in either menstrual weeks or weeks after fertilization (see definitions).
- **LANUGO:** The fine, downy hair on a developing fetus.
- **MENSTRUAL WEEKS:** The age of an embryo or fetus measured from the first day of the mother's last normal menstrual period. Fertilization usually occurs about two weeks after a woman's last menstrual period began. This method of measuring is most often used by practicing doctors and other health care providers.

DEFINITION OF TERMS CONTINUED

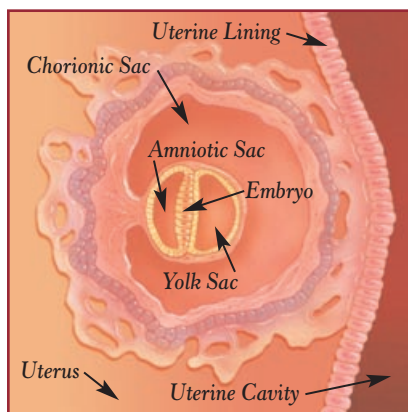
- **NEONATAL INTENSIVE CARE UNIT:** A special hospital unit designed to care for babies needing special, more intensive care than a normal newborn.
- **NERVOUS SYSTEM:** All the nerve cells and tissues of an organism, including the brain and spinal cord.
- **PLACENTA:** The organ attached to the uterus that provides nourishment from the woman to the embryo, then fetus, through the umbilical cord.
- **QUICKENING:** The punching and kicking movements of a fetus.
- **SECOND TRIMESTER:** The fourth, fifth and sixth month of a woman's pregnancy.
- **SURVIVAL RATE:** The possibility that a fetus will survive outside of a woman's uterus. Survival is defined as living a minimum of twenty-eight days after birth.
- **THIRD TRIMESTER:** The seventh, eighth and final month of a woman's pregnancy.
- **UTERUS:** The muscular organ inside a female where the embryo and fetus develop.
- **VERNIX CASEOSA:** A protective cheese-like substance that forms on the fetus later in its development to protect it from the drying affects of the amniotic fluid.
- **WEEKS AFTER FERTILIZATION:** The age of an unborn child measured from the estimated day of fertilization.
- **YOLK SAC:** A fluid-filled sac that provides some nutrients to the very early developing embryo before the placenta takes over.
- **ZYGOTE:** A fertilized egg prior to reaching the uterus.

3 TO 4 WEEKS...

IMPLANTATION

(1 to 2 weeks after fertilization)

Development begins on the day a woman's egg is fertilized by a sperm penetrating it. The fertilized egg immediately begins to divide into two cells, then four, then eight, and so on. At this stage in the *embryo's* development, it is about the size of a pinhead. The embryo attaches itself to the wall of the woman's *uterus* about 5 to 6 days after *fertilization*. Three fluid-filled sacs will surround the embryo to cushion and protect it. These are the amniotic sac, the *yolk sac*, and the chorionic sac. Inside the chorionic sac, the embryo's cells will continue to divide and, within the next few weeks, the *placenta* and the first nerve cells will be formed.



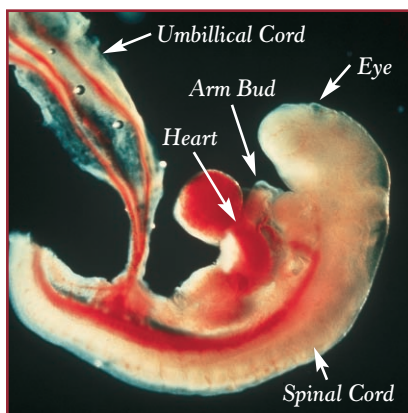
5 TO 6 WEEKS...

THE FIRST HEARTBEATS

(3 to 4 weeks after fertilization)

Between five and six weeks, a woman should have missed a period and a pregnancy test should be positive.

Inside the embryo a distinct blood vessel has now formed. It will later develop into the heart and circulatory system of the child. By five weeks, the embryo's heart is tubular in shape and begins to beat. The connections between the mother and the embryo are developing to form the placenta. The placenta will nourish the embryo, then fetus, for the remainder of its stay in the uterus. A ridge has also formed, running down the length of the embryo. This ridge will later become the brain and spinal cord of the child. Arm and leg buds are also beginning to show at four weeks.



LENGTH: 1/4 inch

8 WEEKS...

ORGAN FORMATION

(6 weeks after fertilization)

At week eight, a pregnancy test will be positive.

The embryo continues to grow, forming more organs, including the brain. The heart of the embryo now has four chambers. Blood is being pumped through the umbilical cord to and from the embryo. The spinal column or spine is made up of cartilage at this stage. Fingers and toes can be recognized, along with the beginnings of the eyes, ears, jaws, lungs, stomach, intestines and liver. The embryo is now surrounded by a sac filled with *amniotic fluid*. The fluid within this sac protects the embryo. Electrical activity begins in the developing brain and *nervous system*.



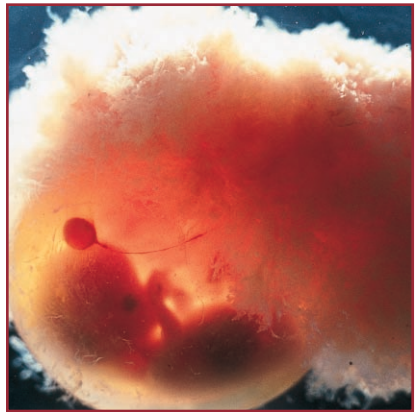
LENGTH: 1/2 to 3/4 inches

10 WEEKS...

NOW A FETUS

(8 weeks after fertilization)

After ten weeks, the embryo is called a *fetus*. The head of the fetus is large and makes up about half of its entire size. At this stage the bones and muscles are forming and the nervous system becomes more and more responsive. Facial features are becoming apparent and the eyes, ears, arms and legs are more identifiable. The first developments of all key body parts have begun by ten weeks.



LENGTH: 1-1/2 inches

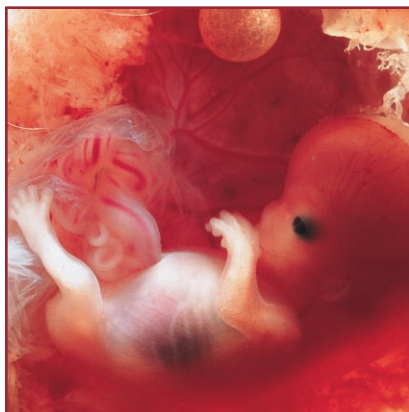
12 WEEKS...

RANDOM MOVEMENTS

(10 weeks after fertilization)

At the completion of the full twelve weeks, the first trimester ends.

At this stage of fetal development, all major external body features have appeared on the fetus, and all major body organs have formed inside. Fingers and toes are distinct and have nails. The fetal heartbeat can be detected electronically now. Between ten and twelve weeks the fetus begins to make small random movements. At twelve weeks however, these movements are too slight to be felt by the mother.



LENGTH: 2-1/2 inches

WEIGHT: 1/2 ounce

14 WEEKS...

GENDER CAN BE IDENTIFIED

(12 weeks after fertilization)

The beginning of the thirteenth week marked the second trimester.

At fourteen weeks, the head of the fetus continues to be the largest feature while the arms are in proportion to the rest of the body. The eyes are now beginning to grow toward the front of the head and have lids. The bridge of the nose is also forming. The fetus now has twenty buds in place for baby teeth and can open and close its mouth as well as swallow. Its kidneys are able to produce urine. At this stage blood is beginning to form in the fetal bone marrow. The fetus now sleeps and wakes. The external genitals have also been forming.



LENGTH: 3-1/2 inches

WEIGHT: 1-1/2 ounces

16 WEEKS...

LIMBS WELL DEVELOPED

(14 weeks after fertilization)

The legs of the developing fetus are becoming well defined by week sixteen. The skin appears transparent. The head of the fetus is still large in comparison to other body parts and is now held erect. A fine layer of hair called *lanugo* has begun to grow on the head.



LENGTH: 5 inches

WEIGHT: 4 ounces

18 WEEKS...

KICKING AND SLEEPING

(16 weeks after fertilization)

At eighteen weeks, the skin of the fetus is pink and still transparent. Ears are now more developed and clearly visible. All of the body and facial features are now recognizable. The fetus can now blink, grasp, move its mouth and sleep. The fetus has also begun to kick, although the mother can most likely still not feel the movement.



LENGTH: 5-1/2 inches

WEIGHT: 8 ounces

20 WEEKS...

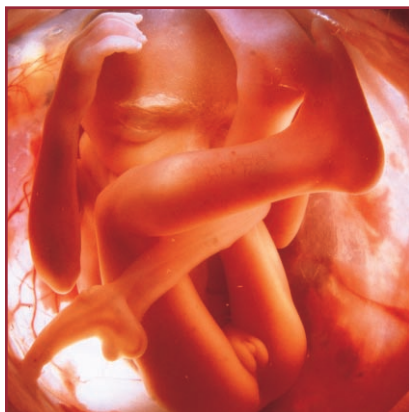
DOWNY HAIR APPEARS

(18 weeks after fertilization)

By twenty weeks, fine, downy hair has begun to appear on the remainder of the body of the fetus.

The mother can now usually feel the fetus moving and kicking.

These movements are referred to as *quickening*. Blood flows through the incompletely developed lungs, but the exchange of oxygen and carbon dioxide is still done in the placenta. At twenty weeks, it is common to do an ultrasound and parents may be told the sex.



LENGTH: 6-1/4 inches

WEIGHT: 3/4 of a pound

22 WEEKS...

TURNING SIDE TO SIDE

(20 weeks after fertilization)

At twenty-two weeks, the kidneys of the fetus are beginning to work and the air sacs of the lungs are continuing to develop. As the skin begins to turn opaque, sweat glands develop. The fetus now becomes more active and can turn side to side. The woman will continue to feel movement. Survival outside the uterus at this stage is not yet possible.



LENGTH: 7-1/2 inches

WEIGHT: 1 pound

24 WEEKS...

SKELETAL DETECTION

(22 weeks after fertilization)

Head and body hair is growing on the fetus by twenty-four weeks. Eyebrows and eyelashes are more noticeable as well. The skin of the fetus is wrinkled, but still very thin. At this point in the development the first layers of fat are beginning to form, and a fetal skeleton can be recognized. Changes are continuing to occur within the lungs of the fetus. At this time, the lungs *may* be developed enough for the fetus to survive outside the uterus. Of the survivors, at least half will have permanent disabilities.



LENGTH: 8-1/2 inches

WEIGHT: 1-1/4 pounds

SURVIVAL RATE: some survive, but require immediate and lengthy intensive care

26 WEEKS...

RESPONDS TO SOUND

(24 weeks after fertilization)

At the completion of the full twenty-seven weeks, the second trimester ends.

The fetal lungs are continuing to develop further. Body movements of the fetus are now stronger and the mother is very aware of them. The skin of the fetus has turned red and wrinkled and is covered with fine hair. The fetus can now respond to sound from both inside the mother's body and outside in the mother's surroundings. At this stage most of the babies born alive will survive if they are born in a hospital with the appropriate medical technology and experts. These babies will require long stays in a neonatal intensive care unit and at least one in four will have permanent disabilities.



LENGTH: 9 inches

WEIGHT: 2 pounds

SURVIVAL RATE: up to 75-80%,
with significant intensive care needs

28 WEEKS...

SUCKS ITS THUMB

(26 weeks after fertilization)

The beginning of the twenty-eighth week marks the third trimester.

The eyes are now partially open and the fetus can suck its thumbs. The thin, red, wrinkled skin of the fetus is covered with a white substance that resembles cheese. This substance is called *vernix caseosa* and it protects the skin from the drying effects of the amniotic fluid. The majority of babies born at this stage of development will survive if they are born in a hospital that provides expert high-risk newborn care. All of these infants will remain in the hospital for weeks to months after being born and at least 10% will suffer from permanent disabilities.



LENGTH: 10 inches

WEIGHT: 2-1/2 pounds

SURVIVAL RATE: up to 88%,
with fewer long-term disabilities

30 WEEKS...

OPEN EYES

(28 weeks after fertilization)

At thirty weeks, the fetus has lungs that can breathe air, although, if it is born at this stage, it may need medical help to do so. Fat is beginning to develop on the body of the fetus and it is becoming more rounded. At this stage the fetus can open and close its eyes and cry. Most babies born at this stage will survive if they are born in a hospital with a neonatal intensive care unit. However, these babies will have to stay in the hospital for several weeks. A few will have permanent disabilities.



LENGTH: 10-1/2 inches

WEIGHT: 3 pounds

SURVIVAL RATE: up to 95%,
with some intensive care required

32 WEEKS...

WRINKLES ON SOLES OF FEET

(30 weeks after fertilization)

From this stage on, *fetal development* centers mostly around growth. The fetus continues to gain weight and produce more fat. Wrinkles have appeared on the soles of the feet. A thick coat of vernix caseosa continues to form on the skin of the fetus. Most babies born at this stage will survive if they are born in a hospital with appropriate medical care. Infants born at this stage will usually require several weeks in a neonatal intensive care unit, but permanent disabilities are rare.



LENGTH: 11 inches

WEIGHT: 3 pounds

SURVIVAL RATE: up to 98%,
with some intensive care required

34 WEEKS...

99% SURVIVAL

(32 weeks after fertilization)

At thirty-four weeks, the fetus is gaining weight steadily at approximately one-half pound per week.

The skin is now pink and smooth.

At this stage the fetus begins to turn its head downward in preparation for birth. The *survival rate* at thirty-four weeks is about 99%.

Some babies born at this stage will require intensive care; only a few will have permanent disabilities.

A few babies born at thirty-four weeks will be able to leave the hospital with their mothers and will not require intensive care.



LENGTH: 12 inches

WEIGHT: 4-1/2 pounds

SURVIVAL RATE: up to 99%,
some will need intensive care

36 WEEKS...

ALMOST FULLY DEVELOPED

(34 weeks after fertilization)

By thirty-six weeks, the fetus is almost fully developed. The body is more round and plump. The face is less wrinkled. The lanugo, or hair, disappears from the face of the fetus, but remains on the head. Muscle tone has now developed and the fetus can turn and lift its head. The fetus should now be in the correct position for birth. At this stage, the survival rate of the fetus is more than 99%.



LENGTH: 12-1/2 inches

WEIGHT: 5-1/2 pounds

SURVIVAL RATE: over 99%,
may need no special care

38 WEEKS...

GRASPS FIRMLY

(36 weeks after fertilization)

The fetus can now grasp firmly. Its body appears plump and rounded. At thirty-eight weeks it weighs approximately 6-1/2 pounds, and, in most cases, is fully developed. The survival rate at this stage is over 99%.



LENGTH: 13-1/2 inches

WEIGHT: 6-1/2 pounds

SURVIVAL RATE: over 99%

40 WEEKS...

FULL TERM

(38 weeks after fertilization)

At forty weeks the fetus is considered *full term*. All body parts are fully developed and the fetus can survive outside of the uterus. The chest of the fetus is defined and the breasts jut out. The fetus now weighs approximately 7.5 pounds and measures roughly 14 inches (about 20 inches from head to toe).



LENGTH: 14 inches

WEIGHT: 7.5 pounds

This booklet is available free of charge upon request by calling the Virginia Department of Health at (804) 786-5916.

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The information in this booklet was gathered from similar booklets published by the Ohio Department of Health, Pennsylvania Department of Health and South Dakota Department of Health, as well as research done via the internet.



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